

DISTRIBUTION OF THE MOSS FAMILY GRIMMIACEAE IN NEVADA

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ABSTRACT.—Twenty-six taxa of Grimmiaceae are listed from Nevada, all representing the genera *Grimmia* and *Rhacomitrium*. *Rhacomitrium heterostichum* (Hedw.) Brid. var. *heterostichum* and *Grimmia atricha* C. Muell. & Kindb. ex Mac. & Kindb. are listed for the first time as occurring in Nevada. Within the state, the Mohave Desert, the Great Basin desert, and the Sierra Nevada display unique composition of members of the Grimmiaceae. *Grimmia anodon* is the most widespread moss in the state. Others, such as *Grimmia rivulare*, *G. conferta*, and *G. alpicola* inhabit only the montane environments of northeastern Nevada.

Nearly 1000 collection or observation sites throughout Nevada were visited during the past four years that the moss family Grimmiaceae has been under investigation. Two genera make up this family in Nevada, *Grimmia* and *Rhacomitrium*. *Schistidium*, in this paper, is used as a subgenus under the genus *Grimmia*.

These mosses constitute a modest percentage of biomass in many plant communities of Nevada. They are restricted to rock habitat, although *Grimmia occidentalis* is occasionally found on the base of trees near stream sides. *Grimmia* subgenus *Grimmia* generally occurs on dry, exposed rock, but *Grimmia* subgenus *Schistidium*, and *Rhacomitrium* occur on rock that is or has been inundated by water from spring snow melt, or deep within rock crevices that offer protection from exposure to the sun and heat.

Members of the Grimmiaceae display unique composition in three geographical areas in Nevada. These areas are (1) the Mohave Desert in the very southern part of the state, (2) the Great Basin desert and associated mountain ranges, which includes most of the state, and (3) the Sierra Nevada in the very western portion of the state.

The Mohave Desert vegetation is dominated by such vascular plants as *Yucca brevifolia* (Joshua tree) and *Larrea tridentata* (creosote bush). In this desert, *Grimmia orbicularis*, *G. wrightii*, *G. anodon*, and *G. affinis* are the dominant and practically the only mosses, sometimes codominating the cryptogamic flora with *Tortula inermis*, *Cros-*

sidium abberans, *C. griseum*, and the hepatic *Targonia heterophylla*. *Grimmia affinis*, originally described as autoicous, is dioicous in Nevada. This agrees with Flowers (1973).

Mesic habitats in this southern desert are found in unusual abundance in the deep canyons of the Spring Mountains just west of Las Vegas. Here, *Grimmia ovalis*, *G. pulvinata*, *G. stricta*, and *G. atricha* grow, along with other common mosses such as *Anacolia menziesii*, *Brachythecium collinum*, *Encalypta intermedia* (i.e. *Encalypta intermedia*), and *Orthotrichum cupulatum*. *Grimmia ovalis* forms unusually long stems in this area, up to 6 cm in length.

G. pulvinata, *G. atricha*, and *G. stricta* occur throughout the Pacific Northwest and might, therefore, be expected to occur in more northerly portions of Nevada. However, the only Nevada collections come from the southern part of the state. *Grimmia atricha* is reported from the Spring Mountains by a collection of Dr. H. Mozingo, University of Nevada, Reno. This represents possibly the most southern distribution for this species. Many endemic and relictual vascular plants occur on this range and this moss could be a holdover from Pleistocene vegetation.

The Great Basin Desert vegetation is dominated by *Artemisia tridentata* (big sage), *Pinus monophylla* (single leaf pinyon pine), and *Juniperus osteosperma* (Utah juniper). Cryptogamically, it is dominated by *Grimmia tenerrima*, *G. anodon*, and *G. calyptrata*. These three mosses commonly grow together at practically all elevations. *Grimmia calyptrata* inhabits predominantly the north-

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western exposures, and *G. tenerrima* and *G. anodon* assume the somewhat more protected northeast exposures. As *G. tenerrima* is dioicous, the male and female plants appear as separate entities due to differences in the lengths of the hairpoints. The male plant, with very short hairpoints, is often confused with *G. anodon*. *G. anodon*, however, is autoicous, thereby making the two easily separable.

Grimmia anodon has the most widespread distribution of probably any plant species in Nevada. The plants in southern Nevada have a much greener appearance, shorter hairpoints, and more erect stems than the same species from the north. *Grimmia calyptrata*, although abundant in northern Nevada, is not found in southern Nevada. It is, apparently,

TABLE 1. A list of the Grimmiaceae in Nevada. Nomenclature for *Grimmia* subgenus *Grimmia* and *Rhacomitrium* generally follows Lawton (1971). Nomenclature for the specific epithet in *Grimmia* subgenus *Schistidium* is based on Deguchi (1979).

Grimmia (subgenus *Grimmia*)

- affinis* Hornsch.
- anodon* B.S.G.
- calyptrata* Hook. ex Drum.
- laevigata* Brid.
- montana* B.S.G.
- orbicularis* Bruch.
- ovalis* (Hedw.) Lindb.
- plagiopodia* Hedw.
- poecilostoma* Card. & Seb.
- pulvinata* (Hedw.) Small
- tenerrima* Ren. & Card. (SY = *G. alpestris* [Web. & Mohr] Nees)
- torquata* Hornsch. var. *torquata*
- trichophylla* Grev.
- wrightii* (Sull.) Aust.

Grimmia (subgenus *Schistidium*)

- alpicola* Hedw. (SY = *G. agassizii* (Sull. & Lesq. ex Sull.) Jaeg. & Sauerb. See Bremer (1980) and Deguchi (1979 and 1979a) for nomenclature of this entity.)
- alpicola* var. *latifolia* (Zett.) Moll.
- ambigua* Sull.
- apocarpa* Hedw.
- atricha* C. Muell & Kindberg ex Macoun & Kindberg
- conferta* Funck
- flaccida* (DeNot.) Lindb.
- occidentalis* Lawton
- pacifica* Lawton
- rivularis* Brid. (SY = *G. alpicola* var. *rivularis* [Brid.] Wahlenb.)
- stricta* Turm.

Rhacomitrium

- heterostichum* (Hedw.) Brid. var. *heterostichum*
(verified by Lawton, 1981)

ecologically replaced by *G. orbicularis* in the south. They both inhabit very exposed rock and superficially resemble each other with regard to long hairpoints on the leaves and the large rounded clumps they both form (resembling small hedgehogs).

On the granitic boulders that follow Salmon Falls Creek in Elko County of northeastern Nevada, *G. poecilostoma* occurs, far north of its otherwise reported range. This moss has supposedly a more southern distribution, including New Mexico, Texas, and Arizona.

In extremely dry situations, such as the flat desert country in westcentral Nevada, *Grimmia anodon* is almost the only existing moss, inhabiting mostly low lying, flat rock. Mosses commonly occurring with the *Grimmia* species of this part of the Great Basin include *Brachythecium collinum*, *Dicranowesia crispula*, *Encalypta intermedia*, *Orthotrichum cupulatum*, *O. jamesianum*, *O. laevigatum* f. *macounii*, *Pseudoleskeella tectorum*, *Pterygoneurum ovatum*, *P. subsessile*, *Timmia megapolitana*, *Tortula papillosissima*, and *T. ruralis*.

Following spring snow melt runoff in the high mountains of the Great Basin, rocks are inhabited by a few members of *Grimmia* subgenus *Schistidium*. These species include *G. occidentalis*, *G. rivulare*, *G. alpicola*, and *G. pacifica*. These mostly occur by themselves, but may occur with such mosses as *Lescuraea incurvata* or *Orthotrichum rivulare*. These mosses nearly always inhabit montane to alpine environments. However, *G. occidentalis*, along with *Orthotrichum rivulare*, was observed to occur in the pinyon-juniper woodlands of the Virginia Range of westcentral Nevada.

Grimmia pacifica, collected in the Santa Rosa Range of northcentral Nevada, is a very interesting plant. The spores measure up to 30 μ m in diameter, and the upper portions of the leaves are keeled with some of the lower leaf margins slightly recurved. This lends some doubt as to its identification, but Lawton (1980) indicates that this species is rarely collected and it may be another variable species in the Grimmiaceae. Personal observation of this specimen plus other specimens from the Pacific Northwest have suggested

that this entity may be nothing more than an ecotype of *G. apocarpa*.

The most successful member of *Schistidium* in Nevada is *G. flaccida*. It is the only *Schistidium* that inhabits extremely dry rock outcrops in this state. It is mostly not found on extreme exposures (southwest faces) but is more commonly found within protected rock crevices on northern exposures. In Nevada, it is interesting to note that the most common *Grimmia*, *G. anodon*, and the most common *Schistidium*, *G. flaccida*, are the only two members of the Grimmiaceae in Nevada that completely lack a peristome. The latter species is common in northern Nevada even though records appear to the contrary.

In the northeastern portion of Nevada, the Great Basin has a greater diversity of dry rock *Grimmia*. Aside from the three dominants previously listed, *G. ovalis*, *G. poecilostoma*, *G. apocarpa*, and *G. flaccida* occur in greater abundance. *Grimmia ambigua* and *G. conferta*, also occur in this area, but more commonly inhabit deep crevices or shady north faces of rocks and boulders. *Grimmia conferta*, in its habitat and general appearance, appears to be a link that connects the subgenera *Schistidium* and *Grimmia*. In Wyoming, Idaho, and parts of northeastern Nevada, this moss forms small rounded clumps on exposed rock surfaces, a habit typical of members of *Grimmia* subgenus *Grimmia*.

The Jarbidge, Ruby, East Humboldt, and Snake mountains are located in the northeastern portion of Nevada. It is in these mountains that many vascular plants from the Rocky Mountains and Pacific Northwest make their only appearance in Nevada. These vascular plants include *Abies lasiocarpa*, *Silene acaulis*, *Saxifraga caespitosa*, *Arctostaphylos uva-ursi*, *Primula parryi*, *Selaginella selaginoides*, and *Astragalus aboriginum*. Along the same lines, the montane environments in northeastern Nevada provide habitat for *G. alpicola*, *G. ambigua*, *G. conferta*, *G. riculare*, and *G. alpicola* var. *latifolia*.

The Sierra Nevada, characterized by the Jeffery pine, lodgepole pine, red fir, and whitebark pine forests, is dominated, with regard to mosses, by *Grimmia tenerrima* and *G. montana*. *Grimmia trichophylla* and *G. torquata* are present and appear to be unique,

in Nevada, to this area. Of particular interest in the Sierra Nevada is the absence of *G. anodon*. This is unusual because this moss is the most widespread in the state, occurring in all counties and elevations from below 300 m in the south to over 4000 m on top of Mount Moriah in east central Nevada. One specimen of *G. anodon* was found in the Sierra Nevada just west of Carson City on Snow Valley Peak. It is a very atypical specimen in that its seta ranges from straight to arcuate and the calyptra is large and cucullate, as well as typically small and mitrate. Substrate does not appear to have a role in the exclusion of *G. anodon* from the Sierra Nevada. The granodiorites of the Fox, Sellinite, Granite, and Wassuk ranges of western Nevada are inhabited frequently by *G. anodon*. These granodiorites are similar and genetically related to the granodiorite of the Sierra Nevada Batholith (Hibbard 1982). Snow pack or summer aridity of the Sierra doesn't play a role either: *G. anodon* occurs in high montane habitats throughout the Great Basin, as well as throughout the desert areas of the state.

Rock inundated by spring snow melt runoff in the Sierra Nevada provides habitat for both *Grimmia occidentalis* and *G. apocarpa*. These are fairly common mosses throughout the entirety of the high montane habitats in the southern Sierra. Also present is *Rhacomitrium heterostichum* var. *heterostichum*, but very rarely in the Nevada portion of the Sierra Nevada. These wet rock mosses occur by themselves and dry rock *Grimmia* occur commonly with *Dicranoweisia crispula*, *Enclypta vulgaris* var. *vulgaris*, *Homalothecium nevadense*, *Orthotrichum laevigatum*, f. *macounii*, *O. praemorsum*, *O. pylaissi*, *Tortula papillosissima*, and *T. princeps*.

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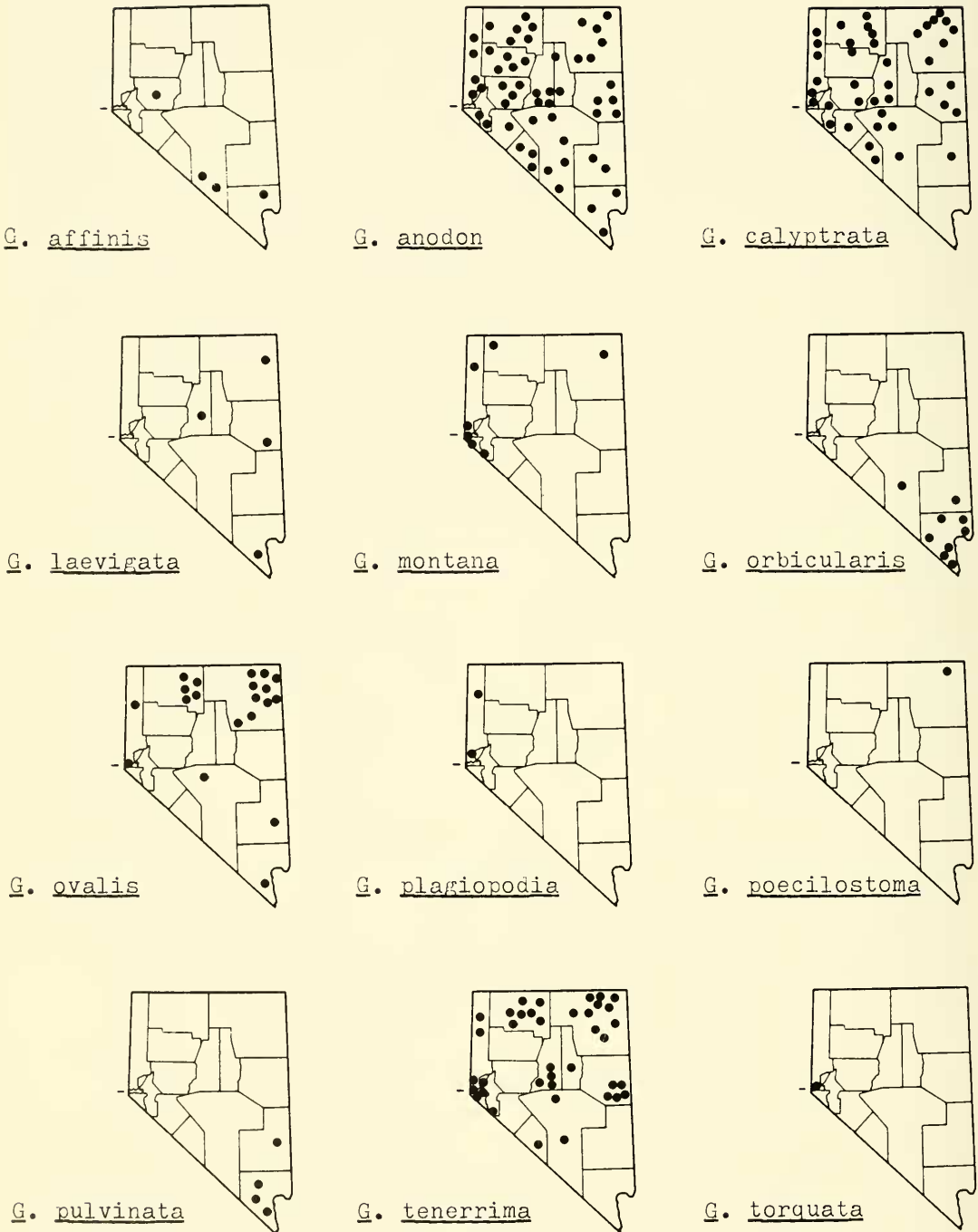


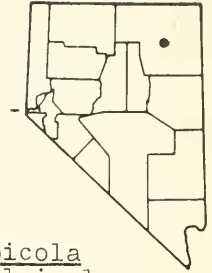
Fig. 1. Distribution of the Grimmiaceae of Nevada. Representative specimens are deposited at the University of Washington, Seattle (WTU). Distribution data come from collections and observations of the author, collections of Dr. H. Mazingo, the University of Nevada, and literature citations given by Lawton (1958). *Grimmia torquata* was not found during the course of this study so the location given by Lawton (1958) is used.



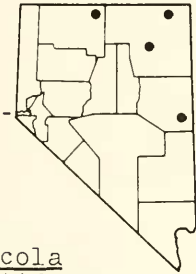
G. trichophylla



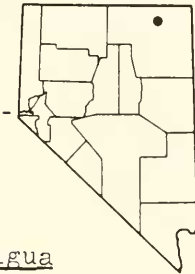
G. wrightii



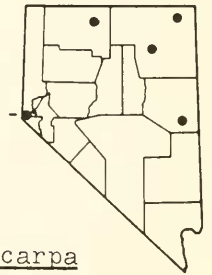
G. alpicola
var. alpicola



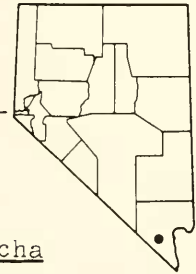
G. alpicola
var. latifolia



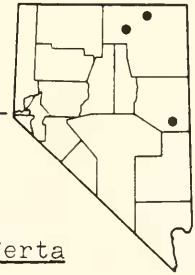
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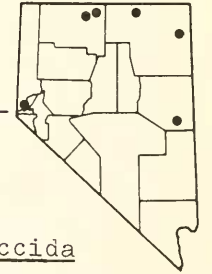
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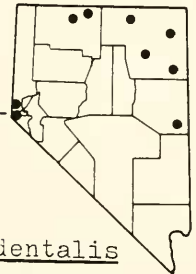
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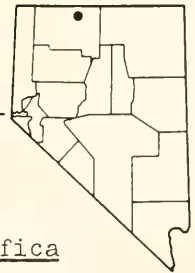
G. conferta



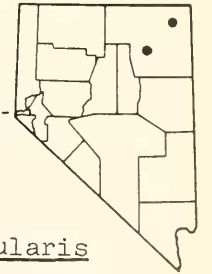
G. flaccida



G. occidentalis



G. pacifica



G. rivularis

Fig. 1 continued.

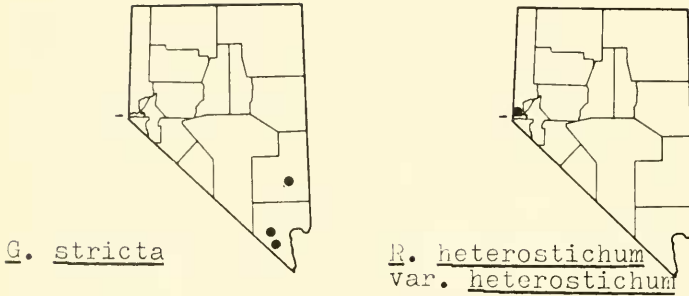


Fig. 1 continued.

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